(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
30 May 2002 (30.05.2002)

PCT

(10) International Publication Number
WO 02/43362 A1

(51) International Patent Classification[7]: H04M 3/51, 1/64, 3/42

(21) International Application Number: PCT/FI01/01011

(22) International Filing Date:
21 November 2001 (21.11.2001)

(25) Filing Language: Finnish

(26) Publication Language: English

(30) Priority Data:
20002563 22 November 2000 (22.11.2000) FI

(71) Applicant *(for all designated States except US)*: **ELISA COMMUNICATIONS OYJ** [FI/FI]; Korkeavuorenkatu 35-37, FIN-00130 Helsinki (FI).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **LAIHONEN, Markku** [FI/FI]; Soukankaari 1 C 72, FIN-02360 Espoo (FI). **ISOTALO, Lauri** [FI/FI]; Pyörökiventie 6 B, FIN-00830 Helsinki (FI). **PELTOLA, Hannu** [FI/FI]; Smedsintie 5, FIN-10210 Inkoo (FI).

(74) Agent: **SEPPO LAINE OY**; Itämerenkatu 3 B, FIN-00180 Helsinki (FI).

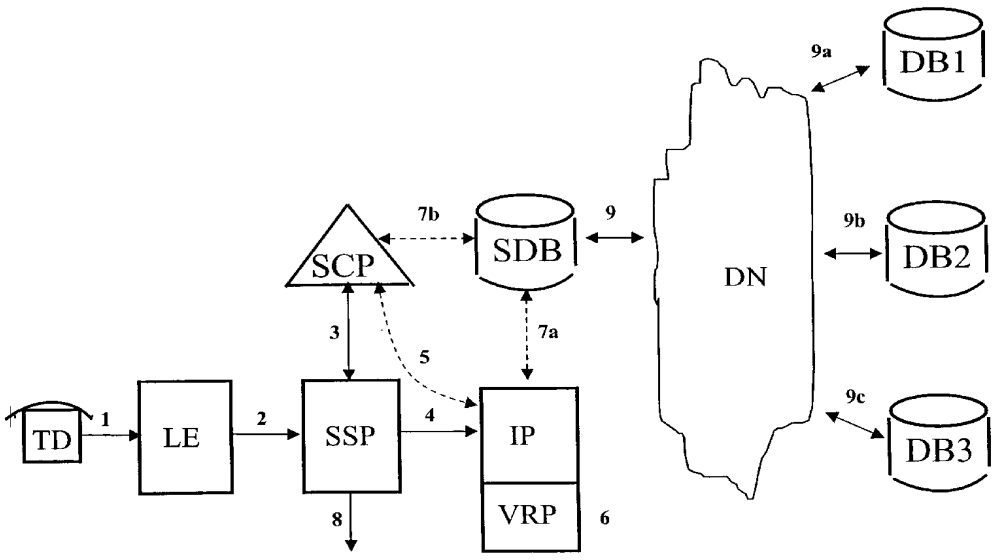
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EC, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

[Continued on next page]

(54) Title: RESOURCE MANAGEMENT IN A CALL CENTER



(57) Abstract: The invention is based on classifying calls, which come to a call centre providing centralized switchboard services, into service classes, on the basis of both the A subscriber's network address and the B network address. After this, the call is provided with a switchboard service, either as a manual operator service, or as an automatic service exploiting speech recognition, according to the service class and the call centre's load. The invention permits the efficient use of switchboard operator resources, thus reducing the occurrence of queuing and service congestion in the call centre. At the same time, it is, however, possible with a relatively high probability to ensure the provision of a high-grade operator service for at least most of the calls that are defined as important.

WO 02/43362 A1

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

RESOURCE MANAGEMENT IN A CALL CENTRE

The present invention relates to a method for providing telephone switchboard services.

In particular, the invention relates to a method, according to the preamble to Claim 6, for the implementation of telephone operator services in a call centre, as well as a call centre suitable for implementing such a method.

The methods to which the invention relates are principally used in call centres. The term call centre refers to a system to which calls are routed to be provided with certain services. Call centres have typically several service persons (operators), to whom incoming calls are distributed. The methods to which the invention relates are particularly used in call centres providing telephone operator services.

The main principles of the activity of a switchboard operator are well known. Switchboard operator operations are utilized, for example, when incoming calls to a company's switchboard, and in older telephone technology calls in a public telephone network, are routed to the correct number. In an operator service, the calls are typically distributed to several operators, while during periods of congestion the calls are placed in a queue, from which the operators pick calls for themselves one at a time. Once the queue becomes full, callers are generally given either a busy tone, or a congestion message requesting them to call again later. During a period of congestion, calls may also be routed to some other facility of the same company.

Switchboard operator operations tie up a significance amount of personnel resources, thus causing quite large costs to companies. A particular problem is the fact that the load on a switchboard varies greatly during even a normal day. In addition, from time to time the switchboard is affected by large unpredictable load peaks, caused by individual factors affecting the group behaviour of customers. Load variations cause major problems in human-operator resource optimization, as too few personnel will cause queuing and congestion at the switchboard, whereas too many will raise personnel costs excessively.

Companies have been impelled to search for solutions to the above problem.

One alternative for reducing the personnel costs caused by switchboard operator operations is to equip the company's switchboard with an automatic operator capability. Such an arrangement is disclosed in patent US 5,799,065. In the solution disclosed in the patent, the company's PBX (Private Branch Exchange) system is equipped with a speech recognition system. According to the patent, a call coming to the switchboard is routed to the speech recognition system, if a manually operated switchboard service is not available. The speech recognition system receives the call and sends predefined messages to the line. In response to the messages, the caller spells out the name of the person they are trying to contact, the name being is identified in the speech recognition system using speech recognition procedures. The speech recognition system links the spelled-out name with the desired name programmed into the company's exchange system, along with the extension number relating to this name. After this, the speech recognition system commands the PBX to route the call in question to the defined extension number.

Another alternative solution to a company's switchboard problems is to outsource the switchboard operator operations. Such switchboard operator services (call-centre services) are provided for customers, for example, by telecommunications operators, such as Elisa Communications and Sonera in Finland. In services of this type, calls are answered in the name of the customer company (the destination company of the call), but the actual switchboard work takes place in the premises of the telecommunications operator providing the service, and using its personnel. Such services are becoming increasingly popular and can be provided to cover an entire country. The popularity of outsourcing switchboard operations is due to factors affecting corporate finances, as well as technical and technological-economical factors. In the case of the technological-economical approach, it is easier for a large company providing call-centre services to optimize and manage the expensive personnel resources required for manually operated call-centre operations. However, individual companies must always dimension their personnel resources according to the congestion peaks at the switchboard. Similar constraints also apply to the technical resources required for call-centre operations.

In outsourced solutions, the switchboard management problems are handed over to the company providing the service. Indeed, the company managing the call centre encounters the same problem of resource optimization, but on an even larger scale. Such a company will also not be helped by the system disclosed in patent US 5,799,065, because the number of people to be contacted through a centralized call centre becomes very great. The large number of people means that the possibility of mistakenly identifying a person becomes too great. An additional problem is that in large groups of people there are always several sharing the same name.

Another problem in systems like that disclosed in patent US 5,799,065 is that calls that are extremely important to the company may be routed to the automatic call-centre service. Even though the automatic call-centre service usually manages to connect a call to the correct desired recipient, the service provided by an automatic call-centre system is often slower than one operated by a person. In addition, many callers feel that a manually operated service is clearly more pleasant. From the point of view of a call-centre service provider, it is thus extremely problematic if calls addressed to a customer company must be routed to an automatic call-centre service connected to the call centre. For the above reasons, call-centre service providers cannot exploit the system disclosed in patent US 5,799,065, at least in the form described in the patent.

The invention is intended to create such a system and method for call centres as will simultaneously

- permit the efficient use of switchboard operator resources

- reduce the occurrence of queuing and service congestion in a call centre

- nevertheless seek to ensure a high-quality, manually operated operator service, at least for the most important calls.

The invention is based on classifying calls, which come to a call centre providing centralized switchboard services, into service classes on the basis of both the A subscriber's network identifier and the B network identifier. After this, the call is

provided with either a manually operated service or an automatic service utilizing speech recognition, according to the service class and the call centre's load.

When calls are classified, the B network identifier is used to determine the service to be provided and to delimit the search database in order to facilitate the speech recognition routine. In this case, the term B network identifier refers to the public telephone network's network address to which the call was made, i.e. on the basis of which the call was routed to the call centre. Usually, the B network identifier is in a numeric form, in which case it is generally referred to as a B-subscriber number, or a called party number.

In the classification of a call, the A-subscriber's network identifier is, on the other hand, used to determine the level of service to be provided for the call. This classification may be, for example, between service classes of the service selected on the basis of the B-subscriber number. The classification is intended to distinguish, with a good probability, between the most and least important calls, from the point of view of call-centre operations. The term A-subscriber network identifier refers to the network address of the calling subscriber. Usually, the A subscriber's network identifier is in numeric form, in which case it is generally referred to as the A-subscriber number or the calling party number.

More specifically, the method according to the invention is characterized by what is stated in the characterizing portion of Claim 1.

The method of the invention relating especially to call centres is, in turn, characterized by what is stated in the characterizing portion of Claim 6.

The call centre system according to the invention is, in turn, defined more specifically in Claim 17.

Considerable advantages are gained with the aid of the invention.

In the solution according to the invention, call classification according to the B network identifier permits the search group to be effectively delimited, which in turn permits the

use of an automatic service, based on speech recognition, in a call centre environment.

Furthermore, when applying the automatic service according to the invention, it is possible to

- permit efficient use of switchboard operator resources

- reduce the occurrence of queuing and service congestion in the call centre

- nevertheless ensure with a relatively good probability that at least most of the calls classified as important can be provided with a high-grade manually operated operator service.

Switchboard operator resources can be used efficiently because, with the aid of the invention, a call routing service based on automatic speech recognition can be linked to form a part of an extensive call centre. Thus, the automatic call routing can be regarded as an overflow channel, allowing a smaller number of human operators to be allocated, because, during congestion peaks, the number of calls routed to the automatic service can be increased. The number of human operators can also be reduced by using routing to the automatic service as a default value for some of the calls.

The invention can also be used to reduce the occurrence of queuing and service congestion in the call centre, as the automatic routing service can be equipped relatively cheaply with excess capacity in case of congestion peaks.

Despite the aforesaid advantages that are sufficiently important in themselves, the solution according to the invention can also be used to route, with a high probability, the most important calls to a manually operated service. This is based on the call classification on the basis of the A-subscriber network identifier and on particular observations relating to this classification, made when analysing the workload of companies' switchboards.

A large number of the calls routed through company switchboards actually originate

from the company's own employees. Our research has shown that up to more than half of the calls routed by the switchboard are, in fact, internal company calls. This phenomenon appears to be due to the fact that company employees prefer to call their colleagues through the switchboard, rather than to begin searching for their colleague's extension number. Particularly when calling from a mobile phone, company employees prefer to use the connection services provided by the switchboard, as mobile phones are often used in places where the company's internal extension directory is not available. The company's own employees therefore account for a significant part of the company's switchboard capacity and thus substantially increase their employer's costs. This is so even though employees generally have precise information on the call's desired recipient, and therefore really do not need high-grade manually operated call-routing services.

Our invention has indeed preferred embodiments, in which calls originating from company employees are screened out from the calls coming to a company's switchboard and are classified into a lower service class. In some embodiments, this can mean that calls made from the company's own telephone numbers are always routed by default first of all to the automatic operator service. This has the important advantage of reducing the number of calls coming to the manual operator service by as much as half, with no deterioration in the level of switchboard service experienced by customers. On the contrary, the level of service to customers may even improve, as the probability of queuing and congestion is reduced. In addition, the work motivation of the human switchboard operators may increase, as there will be less work dealing with routine operations and more concerning requiring customer service.

Our invention has therefore many different embodiments, in which calls coming to the switchboard operator can be routed to either the manual or the automatic service, on the basis of various routing criteria. Possible routing criteria include the length of queue in the call centre, the time of the call, and the origin of the call (e.g. internal call/external call division). Further, in some embodiments the system can have a 'lunch connection', which, when switched on, will route all calls to the automatic operator.

Besides the routing criterion, call routing can also be influenced with the aid of priority

classes defined according to the call's origin. The priority classes can be defined customer-specifically, as call classification is also based on the B network identifier. The priority classes for a customer company of the call-centre service can be, for example, as follows:

1. call coming from abroad

2. external call coming from home country (external call = call made from somewhere other than the company's own number)

3. internal call, i.e. call made from the company's own number.

Calls can be divided between the automatic operator and the human operator in a sequence according to the priority classes, for example, so that

- calls belonging to class 1 are always routed to the manually operated service

- calls belonging to class 2 are routed to the manually operated service, if at least a predefined number of human operators are free, otherwise the calls are routed to the automatic service

- calls belong to class 3 are always routed to the automatic service.

The number of priority classes can be varied, according to the embodiment and the requirements of the customer company. Thus, unlike the example above, there may be, four, five, or six priority classes, though there must always be at least two. Besides these multi-class services, if necessary, it is certainly also possible to use routines that do not use priority classification, i.e. which have only a single priority class. The service to be performed for calls in each priority class can also be defined in very many ways. For instance, in the example described above, it is just as possible to define that calls belonging to class 1 will be routed to the manually operated service, provided at least one human operator is free at precisely that time - otherwise the call is to be routed to the automatic service. On the other hand, the definition for calls in class 3 may be for the

calls to be routed to the manually operated service, provided at least a preset number of human operators are free, the number being naturally set to be greater than the corresponding number set for class 2. In other cases the calls are routed to the automatic service.

It should also be noted that a single call centre can simultaneously produce services, which may even differ very greatly, for different customers. It is therefore possible to implement a call-centre service tailored to the needs of each customer company.

The priority classes in the embodiments of the invention can be defined, for example, with the aid of tables. The caller's A number, or other appropriate information transmitted in the telephone network's signalling, can be used in classification. For example, this can be information on whether the call is domestic or foreign. If the A number or a similar identifier is not obtained, the call can be interpreted as belonging, for example, to the class of foreign calls.

On the basis of the A number or another similar identifier, certain calls can also be classified according to a higher priority, so that the call will be usually routed to a human operator. For instance, such a definition can be made for so-called VIP customers. The priority class can also be raised, for example, for calls made from an analogue mobile phone or a VoIP network, as the poor quality of the telephone connections may make the speech recognition program unable to cope with recognition.

In some preferred embodiments of the invention, the call-centre service's database is linked through a data network to the database of the customer company, from which batch processing can be used to update the data required in the service. Such data can include the names and telephone numbers of persons served by the company's switchboard operations as well as, if desired, information on holidays, leave, or other information that may need to be given to customers. This procedure can also be used to maintain sound samples of the name of each employee.

Further, in some preferred embodiments of the invention, statistical data on speech recognition performance, for example, the percentage of calls in which speech

recognition has succeeded, can be sent from the call-centre service's database to the customer company. In addition, it is even possible to send unrecognized sound files to the customer, for example, so that the recognition of difficult-to-pronounce names can be improved.

Further, in some preferred embodiments of the invention, the customer company can be provided with its own interface with the service, allowing it to alter the settings of the call-centre service and particularly to provide sound files for speech recognition, if they are required by the speech recognition method in use. If desired, the settings of the VPN network can also be altered through the same interface. In addition, the customer company can examine unrecognized sound files through the same interface. Should speech recognition have failed for some reason when processing a call made to a customer company employee, the sound files can be recorded in the system.

In the following, the invention is examined with the aid of examples and with reference to the accompanying drawings.

Figure 1 shows a diagram of one method of the invention and the related system environment.

Figure 2 shows a flow diagram of a second method according to the invention.

Figure 3 shows a flow diagram of one classification method according to the invention.

Figures 4 - 7 show flow diagrams of the call-routing processes, which can be used in the methods according to the invention.

Figure 1 shows a land-line telephone subscription TD (terminal device) connected to a public telephone network through an LE (local exchange). The LE is further connected to an SSP (service switching point), which in turn is controlled by an SCP (service control point). The figure's system environment also includes an SDB (service database), from which the SCP can retrieve the necessary parameters for call routing. Further, the system of the figure includes an IP (intelligent peripheral) connected to the DB, SSP, and the SCP, which is intended to automatically select the destination

subscription and especially to perform speech recognition. A VRP (voice recognition program) is connected to the IP for speech recognition. The figure also shows a DN (data network), over which the DB can connect to the databases DB1, DB2, and DB3 of the service's customer company.

Figure 1 also shows the operations that can be performed when using the system to route calls. The following examines in greater detail the operations involved in call routing.

In the example of Figure 1, the service user contacts the call-routing service through the TD and a telecommunications network supporting voice transfer (stage 1). In the network, the call is routed through the SSP (stage 2) by means of a suitable known method, for instance, by using TDP 3 triggering based on the dialled number, or some other suitable intelligent network triggering, such as TDP 12 triggering. Having received the call, the SSP forms a service request to the SCP using the INAP protocol (stage 3 - first direction). The service can be identified in the SCP, for example, from the caller's number and the dialled destination number. In the SCP, this leads to the service logic, on the basis of the result of which, the SCP requests (stage 3 - second direction) the SSP to connect the call.

For call-routing instructions, the SCP's program checks if there is a currently valid setting that would route the call to the automatic operator. If there is not, the call is routed to the human operator. If the automatic operator routing is 'conditional' (e.g., tripped by the queue length), the call is then analysed in greater detail. The call is routed to a location according to the priority class (e.g., 1/2/3) based on origin. If automatic routing is 'on' (e.g., during lunchtime), all calls are routed to the automatic operator.

If the call belongs to a particular class, the SSP waits to monitor the call. The SSP then waits to check if the call is answered in the manual operator service or not. If the manual operator service is congested, so that the call is not answered within a specific time, for example 10 seconds, the call routing returns to the SCP. The SCP then commands the SSP to route the call to the automatic operator.

If the call requires the automatic operator service, the call is routed (stage 4) to the IP

connected to the intelligent network. At the same time, the SCP creates a logical INAP connection (stage 5) with the IP.

The external IP now preferably gives the caller a message defined by the SCP and goes on to receive the data coming from the connection. In the primary embodiment, this data is speech, which is converted into digital form in the network. Connected to the IP is a voice recognition program VRP, which can form the words corresponding to the 'speech data' coming from the connection. The VRP compares the words it has formed with the data in the external service database DB (stage 7a). As calls classified on the basis of the B network identifier are used in the method, a comparison can be made with the data in the DB's company-specific directory. If the program finds compatibilities between these data, it sends the SCP the correspondences obtained, over the signalling connection (stage 5). From the DB, the SCP retrieves the destination number corresponding to the name (stage 7b) and requests the SSP to connect the call to the given destination number (stage 8). At the same time, the SCP commands the SSP to disconnect the connection to the external IP.

In the system of Figure 1, the name and person data in the database DB connected to the telecommunications network can be easily updated over the data network (stage 9) by batch processing from the company's own databases DB1, DB2, and DB3 (stages 9a, 9b, 9c).

Thus, if an end customer calls the number of the company's call-centre service, or clicks a voice connection from the company's Web or WAP site, or from a portal, a connection is formed over a public telecommunications network to the routing service, where the call routing of the company's call-centre service takes place. Calls coming to the number of the company's switchboard operator are routed through the service in the network, so that the operations are typically controlled by an application (or similar), which is in the intelligent network's SCP. The SCP then discusses the routing of the call with the network's connection server (typically an SSP).

Thus, calls are not routed in the traditional manner from the telecommunications network directly to the company's extensions where the call centre service has been conventionally implemented, but instead to a routing service implemented in an

intelligent network. The totality includes not only a normal call-centre service operated by a person, but also a second alternative routing destination - an automatic call-centre service.

Calls coming to the number of the company's switchboard operator are divided into at least two separate priority classes, according to their origin. The priority classes can be, for example, the following:

1) Calls coming from abroad

2) External domestic calls

3) Internal company calls.

These classes are used to determine the default destination for routing a call. In addition to this, during congestion peaks calls with a lower priority can be routed initially to the automatic operator instead of a human operator. As the queue continues to fill, calls of the next priority begin to be routed to the automatic service, and so on. In this case, calls coming from abroad are the last to be routed to the automatic service.

The A number, or some other corresponding identifier travelling in the network's signalling, can be used to identify the origin of a call. For example, in foreign calls the A number is often not available. In that case, the call can be interpreted as coming from abroad on the basis of a missing A number. Alternatively, is possible to use a suitable field in the telephone network's signalling, which permits the marking of foreign calls in telephone exchanges handling foreign traffic. In practice, in unclear situations it is safer to interpret the call according to a higher priority and route it primarily to a human operator.

One possible routing practice is as follows -

Calls belonging to class 1 are always routed to a call-centre service operated by a person, calls of class 2 are principally routed to a human operator, but during congestion they are

routed to the automatic operator. Class 3 calls are routed primarily to the automatic service, from which calls can be transferred if necessary to the human operator.

In addition to this, all calls can, if necessary, be transferred to be handled automatically, if the operator service is not available. Such situations could be, for example,

- in evenings and at night

- on holidays

- during a technical fault in the operator service

- during lunchbreaks.

Routing takes place in a program in the SCP. The call-centre service administrator can alter the routing (settings, database data, etc.), for example, through a telephone interface or a Web or WAP interface.

The service's database can be connected to the customer's database in such a way that the customer's database updates the data in the network's database. The updated data include information such as the names of the company's personnel and their corresponding telephone numbers (land-line + GSM, etc.), possibly their departments and titles, etc. In addition, it is possible to update real-time information on the situation in call centre service in the company's network, for example, the length of the queue, etc. Further, in this way it is also possible to maintain sound samples of each employee's name.

Statistical data on the performance of the speech recognition (e.g., how many percent of the calls it has been possible to recognize) can be sent from the service's database to the customer's database. In addition, it is even possible to send unrecognized sound files to the customer, so that, for example, the recognition of difficult-to-pronounce names will improve. Thus, the customer itself can examine sound files that have failed to be analysed in the speech recognition, and make one or several additional sound samples and add them to supplement the sound samples of the relevant name already in the

service database.

Routing of a call to the automatic operator can thus trigger a great many criteria. These can all be defined customer-specifically, either in the SCP's database, or in the external network's database used by the SCP (e.g., DB of Figure 1).

When a call transfers to the automatic operator service, it is routed to equipment connected to the intelligent network (in this description, the IP of the intelligent network), to which a speech recognition application is connected. The speech recognition application receives the call, analyses the caller's speech and forms a character string from it, and retrieves from the company-specific section of the service's database the information closest to it - in this a person's name. This name corresponds to a number of the company in the SCP's database or the external database, on the basis of which the call is routed through to the desired destination.

In the system according to the invention, any suitable speech recognition software whatever can be used as the actual speech recognition application. One alternative is to use the system disclosed in the patent US 5,799,065 referred to above. In this system, the name of the person is spelled out to the program. Nowadays, however, relatively good speech recognition systems for recognizing entire words are already commercially available. Such programs have the advantage that the caller can pronounce the desired recipient's name normally, just as to a switchboard operator. Speech recognition programs of this kind are supplied, for instance, by Philips.

Speech recognition is preferably implemented in such a way that part of the analysis is carried out in the service database SDB (stage 7a, in Figure 1), because it contains sound samples of the names of all the employees of all the customer companies.

However, the sound sample analysis exploits the information that the name pronounced in the speech recognition refers to the employees of a specific company. This considerably facilitates analysis, because even though the service covers hundreds of companies and tens of thousands of recognizable names, even if a particular name is pronounced very unclearly it can be linked to the correct information, if it is known that

the name must refer to one of, for example, the 50 employees of a specific company.

The method described can easily be applied in companies that outsource their switchboard operator services to telecommunications operators. In that case, data is regularly retrieved from the companies' own databases for use by the service's own master database SDB. A company's numerical space and its use, as well as the numbers and names of people employed by the company can then change greatly, but despite this the call-centre service can always be provided with the correct information. This naturally offers a great saving in costs to the telecommunication operator providing the service, allowing it to expand its market share competitively. A significant advantage comes from the fact that the personnel of customer companies and their extension numbers change all the time. Thus existing technologies cannot be used to update the information sufficiently rapidly for speech recognition to function reliably in outsourced services.

Existing products and technologies are also unable to allow new customer companies to be added flexibly to be part of a call-centre service based on speech recognition. In the solutions disclosed in this application, it is relatively easy to introduce new customer companies to the system.

The examples of systems and methods described above can be varied in several different ways.

For example, the program in the IP device can, besides determining the destination name from the received speech data, also retrieve the telecommunications network telephone number (or some other similar address of the destination) corresponding to the name and notify the SCP of this for the connection of the call. Unlike the example of Figure 1, this eliminates method stage 7b, i.e. the SCP does not have to separately ask for the destination number. In fact, in this case it is not even necessary for the SCP to know the name of the desired recipient.

Another possibility is for the application in the IP to be set to control the SSP directly. Thus, the IP could directly, without a new SCP link, command the SSP to connect the call to the determined destination number. This arrangement allows the SCP's load to be

reduced.

The description does not refer to a public telecommunications network, but to a 'telecommunications network supporting speech transmission', because the operation according to the invention can be arranged in any kind whatever of telecommunications network, in which centralized control functions, which are separate from the connection of the call, are available according to the intelligent network's SSP and SCP logic. In addition, the network used must support the requirements of real-time speech transmission, at least sufficiently for the speech recognition application to be able to interpret words transmitted over the network. Such a network can be, for example, a VoIP network equipped with QoS capabilities. The intelligent network's SCP (if, for example, INAP signalling is used to connect the VoIP network's exchange to the intelligent network's SCP centre), or another IP network server corresponding to the SCP, can then act as the control centre for a call.

Figure 2 shows the principal features of one possible arrangement for processing a call coming to a call centre. The call is routed to the call centre on the basis of a specific B number. The B number can be, for example, the number of the company switchboard linked to the call-centre service. The B number can also be a company extension number, from which the call has been transferred. In the case of a transfer, the switchboard number can be a so-called C number. In any event, when the call comes to the call centre the call is classified on the basis of its destination (block 21). The call is then identified as belonging to a particular service on the basis of the B or C number. The service operating on the basis of the B number is simple. In it, the call is identified in the call centre as belonging to the specific company's switchboard service only if the call was originally made to this company's switchboard number, i.e. the B number is the company's switchboard number.

If desired, it is also possible to bring calls into the sphere of the call-centre service through other routes. For example, the company may have several B numbers, calls to which are routed to the same service of the same call centre. Calls transferred from the company's extensions can also be routed to the company's outsourced call-centre service, such calls being identified either on the basis of the B number, by comparing the

call with the B number list, or on the basis of a C number. In the solution based on the B number, the B-number list should contain all the extension numbers, thus easily making it unwieldy to implement. However, most of the B numbers may have the same prefix, allowing the list to be shortened significantly. If a C number is used, the C number can be the company's switchboard number or some other number, calls made to which are routed to their own service. Such a service can be implemented in such a way that all calls coming to the service are transferred calls, so that the further processing of the calls can be chosen to be optimal for transferred calls. Thus even the same company can have several different switchboard services in a single outsourced call centre.

Once a call has been classified, a service corresponding to the classification is initiated (block 22). Next, the call is routed according to the service definition. In some cases, the service may be defined in such a way that all calls coming to the service are routed directly to a specific number or service location, for example, to a manual switchboard service, to an automatic operator, or to a messaging device. However, the service often includes analysis of the call and further classification (block 23). In this classification, a priority class is defined for each call, with further processing of the call taking place according to the corresponding settings. After definition of the priority class, a process corresponding to the priority class is initiated (block 24). In the example of Figure 2, a call has arrived at a service that has four separate priority classes. If the call had been made to some other B number, another service could have been selected in block 21 and the number of potential priority classes for the call would also have possibly been different. The number of priority classes can thus be selected freely according to the desired service characteristics. There may also be only a single priority class, but in that case too the system should also have services in which there are at least two priority classes.

Figure 3 shows in greater detail one possible priority class definition process, which can be implemented, for example, in block 23 of Figure 2. When a call arrives in the process, a check is first made in block 31 as to whether the caller's A number has been transmitted with the call. If the A number has not been transmitted, the call is routed to processing according to the priority class P2. For example, the A number may be missing because the call originated abroad. The call may also have originated from an

unlisted number. If the A number can be identified, the call is routed to block 32. In block 32, a check is made as to whether the A number can be found on the company's VIP list. If the number is found on the VIP list, the call is routed to the VIP service, which in this example has the priority class P1. If the A number is not on the VIP list, a further check is made in block 33 as to whether the call originated abroad. The check can be made, for example, on the basis of the A number, or possibly on the basis of a suitable foreign call code attached to the call. If the call is from abroad, the processing of the call is routed to a process according to the priority class P2. If, however, the call did not originate abroad, a check is made as to whether the number is one of the company's own extensions. If the calling number is one of the company's own numbers, the call processing is routed to a process according to the priority class P4. In all other cases, the call is routed to a process according to the priority class P3.

Figures 4 - 7 show some possible processes relating to priority classes. Though the processes of Figures 4 - 7 can be used, for example, in connection with the processes shown in Figures 2 and 3, the application of the processes of Figures 4 - 7 is in no way restricted to the methods of Figures 2 and 3. Equally, the application of the methods of Figures 2 and 3 is in no way restricted to the processes shown in Figures 4 - 7. However, in the following, the processes of Figures 4 - 7 are depicted in such a way that they form part of the methods of Figures 2 and 3.

Figure 4 shows the routing of calls of priority class P1. Thus in this example these calls are VIP calls and it is wished to give them the very best possible service. This means primarily manual operator service. However, if there is a long queue in the manual operator service, a VIP customer can be routed to the automatic service, so that the queuing time will not be unreasonable. Of course, this possibility can be reduced by defining a separate queue to the manual operator service for VIP customers, which is emptied first as operators become free. Only once all the VIP customers have been routed from the queue to a service are calls from the normal queue begun to be routed to the operators. In the example of Figure 4, a query is made in block 41 to determine the length of the queue. Thus, depending on the embodiment, the length of the queue may be either the length of the VIP queue, or the length of the general queue if a separate VIP queue has not been defined. If there are fewer calls in the queue than a predefined

number Q1, the call is routed to the manual operator service (block 42). If, on the other hand, the queue is too long, the call is routed to the automatic service (block 43).

Figure 5 shows the routing of calls of priority class P2. Thus, in this example these calls are mainly foreign calls and calls made from unlisted numbers. It is wished to give these calls manual operator service, as the performance of speech recognition in foreign calls is assumed to be poorer than in other calls. This due to factors such as the quality of the telephone connection and possible language problems. However, if there is a very long queue in the manual operator service, the call can be routed to the automatic service. In the example of Figure 5, a query is made in block 51 to determine the length of the queue. The queue being used can be the general queue, or else foreign calls may have their own queue, which is intended to be emptied faster than the queue defined for domestic calls, and from which calls are intended to be routed to operators with the greatest language proficiency. If there are fewer calls in the queue being used than a predefined number Q2, the call is routed to the manual operator service (block 52). If, however, the queue is too long, the call is routed to the automatic service (block 53).

Figure 6 shows the routing of calls of priority class P3. Thus the calls in this example do not belong to other classes and are mainly domestic calls originating from outside the company. In this group, there is a relatively high probability that the automatic operator will succeed. It would, however, it is preferred to provide this group with manual operator service, should it be available. The service given to this group should not, however, be allowed to worsen the service for calls in groups P1 and P2. It is therefore possible to operate as follows. A query is made in block 61 to determine the number of free operators and to make a comparison. If the number of free operators is greater than a predefined number V3, the call is routed to the manual operator service (block 62). If, on the other hand, there are fewer free operators, the call is routed to the automatic service (block 63). V3 can also be set to zero, in which case the call will be routed to the manual operator service, provided even a single operator is free to receive the call.

Figure 7 shows the routing of calls of priority class P4. In this situation of the call centre service, these calls are calls made from the company's own extensions. The manual operator service has the greatest probability of success with this group, nor is it wished

for the calls of this group to burden the manual operator service. All the calls are therefore routed directly to the automatic service (block 71).

By means of an arrangement according to Figures 2 - 7, calls can thus be distributed between the manual and automatic operator resources in such a way that the call centre's level of service is not substantially reduced, but rather improves due to the shortened queuing times. Possible failures of the automatic recognition are also not a great problem, provided the service is equipped with a capability that routes a calls to an operator should the automatic service fail.

Claims:

1. A method for providing telephone switchboard services, in which method calls coming to the switchboard service are classified into service classes according to the A subscriber's network identifier and the B network identifier, and after this call-centre services are provided for the calls either as manually operated services or as automatic services according to the defined service classes and the load on the switchboard service.

2. A method according to Claim 1, in which the automatic service utilizes an automatic speech recognition method.

3. A method according to Claim 2, in which the B network identifier is used to define the service to be provided and to delimit the search database, in order to facilitate the speech recognition routine.

4. A method according to any of Claims 1 - 3, in which the A subscriber's network identifier is used to define the level of service to be given to a call.

5. A method according to any of Claims 1 - 4, in which the A subscriber's network identifier is compared with a network identifier list, which is formed from the network identifiers of the switchboard service's destination company's own extensions, and, if an identifier corresponding to the A subscriber's network identifier is on the list, the call-centre service is provided primarily as an automatic service, thus saving personnel resources to serve calls coming from outside the company.

6. A method for implementing telephone operator services in a call centre, in which telephone operator service at least two different call-centre services, which can be defined customer specifically, are provided, which method includes the following stages:

- a call made to the customer's network address is received,

- the destination address of the received call is identified, and

- a switchboard service for the call is chosen according to the identified destination address,

c h a r a c t e r i z e d in that the selected switchboard service includes at least two priority classes, of which priority classes at least one priority class routes calls primarily to automatic service resources and of which priority classes at least one other service class routes calls primarily to manual operator resources, and that in the selected switchboard service:

- the A network address of the call is analysed,

- the call is classified in one of the priority classes included in the switchboard service on the basis of the analysis of the A network address,

- a routing process according to the priority classification is initiated for the call, and

- the call is routed to a service resource defined according to the initiated routing process.

7. A method according to Claim 6, in which the destination address of the call is the B network address of the call.

8. A method according to Claim 6 or 7, in which the destination address of the call is the C network address of the call.

9. A method according to any of Claims 6 - 8, in which speech recognition software is the automatic service resource of the call.

10. A method according to Claim 9, in which, to facilitate speech recognition, the name database is delimited on the basis of the selected call-centre service so that a customer-specific name database is selected for the call and the received name data is compared to this customer-specific name database with the aid of speech recognition software.

11. A method according to Claim 10, in which the customer is provided with an interface for updating its own customer-specific name database.

12. A method according to any of Claims 6 - 11, in which calls with an A network address that cannot be analysed are classified as belonging to a particular priority class.

13. A method according to any of Claims 6 - 12, in which calls originating from abroad are classified as belonging to a particular priority class.

14. A method according to any of Claims 6 - 13, in which the A network address is compared with an A network address list and, if the A network address is found on the list, the call is classified as belonging to a particular priority class.

15. A method according to Claim 14, in which the A network address is compared with a list of A network addresses in the possession of the subscriber to the call-centre service, and if the A network address is found on this list, the call is routed primarily to the automatic service resource.

16. A method according to Claim 14, in which the A network address is compared with a list of the A network addresses that are regarded as most important by the subscriber to the call-centre service, and if the A network address is found on this list, the call is routed primarily to the manual operator resource.

17. A call-centre system, c h a r a c t e r i z e d in that it includes logic means for implementing a method according to any of Claims 6 - 16.

18. A system according to Claim 17, which includes an automatic speech recognition device for identifying the name of the desired recipient of the call.

19. A system according to Claim 18, which includes database means for comparing the name identified by the speech recognition device with customer-specific databases.

20. A system according to Claim 19, which includes communication and updating means

for updating the customer-specific databases, which are recorded on the database means, on the basis of the customer company's own databases.

21. A system according to any of Claims 17 - 20, which includes means for providing the customer with an interface for updating its own customer-specific database.

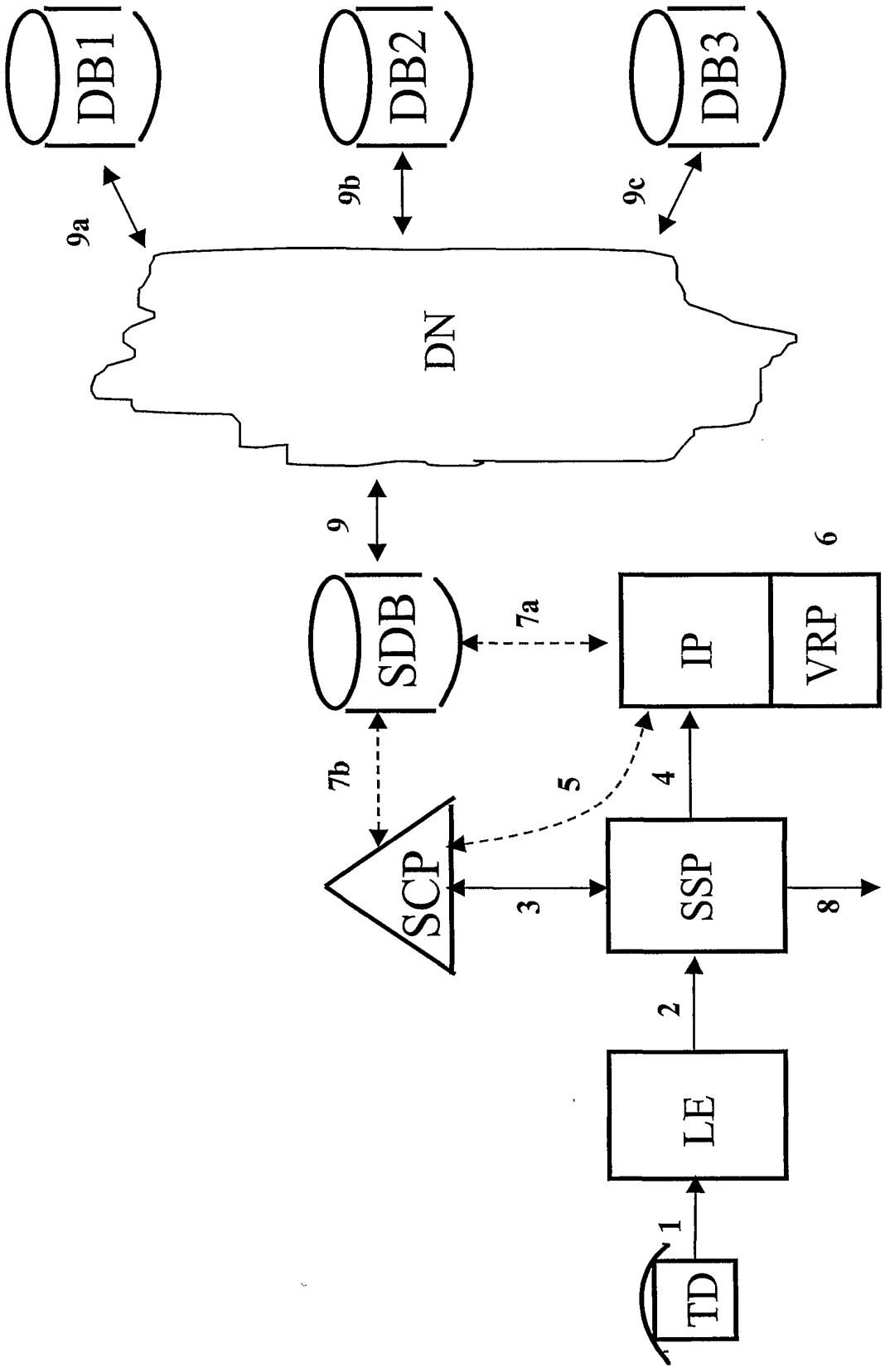


Fig. 1

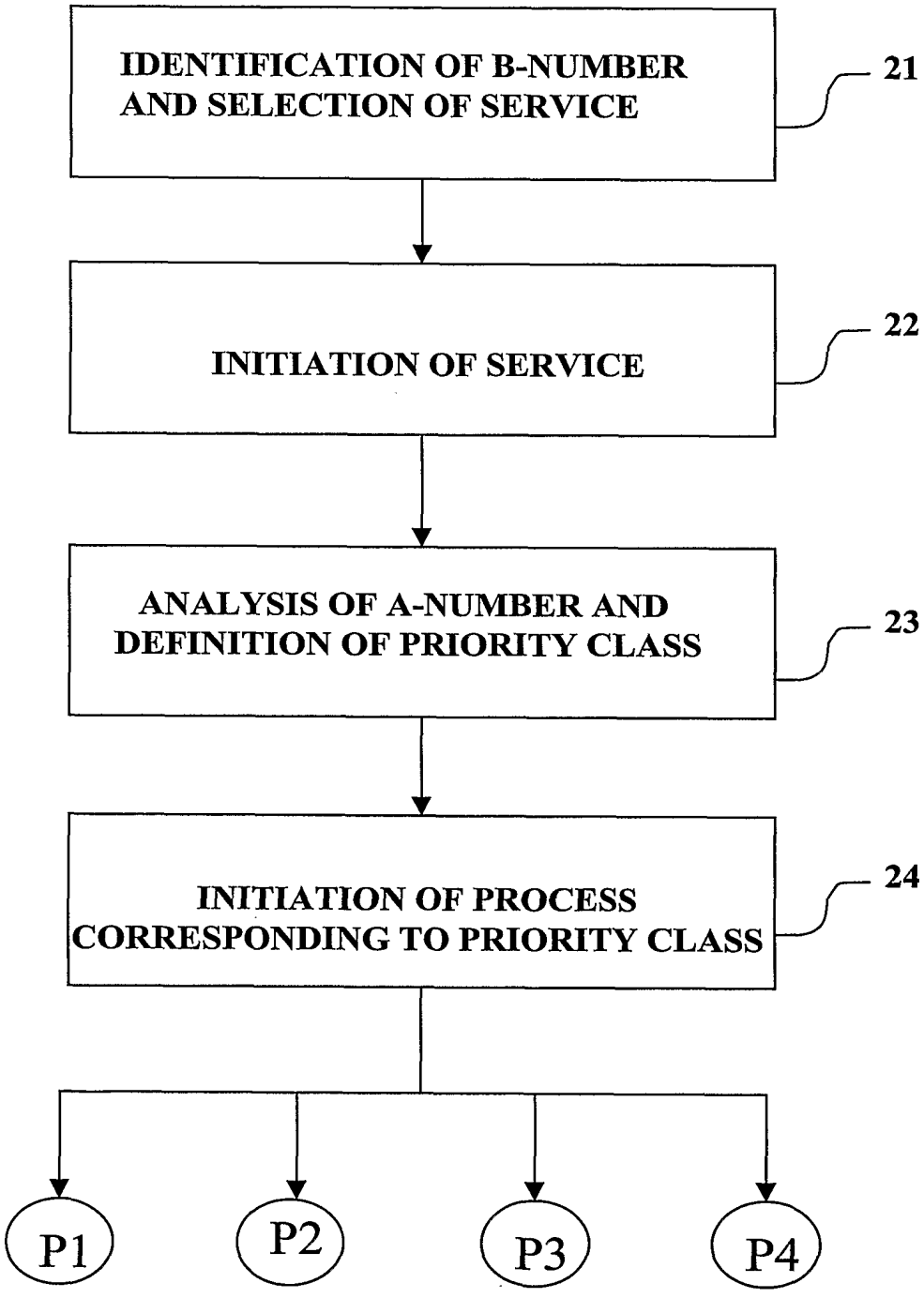

IDENTIFICATION OF B-NUMBER AND SELECTION OF SERVICE
21
INITIATION OF SERVICE
22
ANALYSIS OF A-NUMBER AND DEFINITION OF PRIORITY CLASS
23
INITIATION OF PROCESS CORRESPONDING TO PRIORITY CLASS
24
P1
P2
P3
P4

Fig. 2

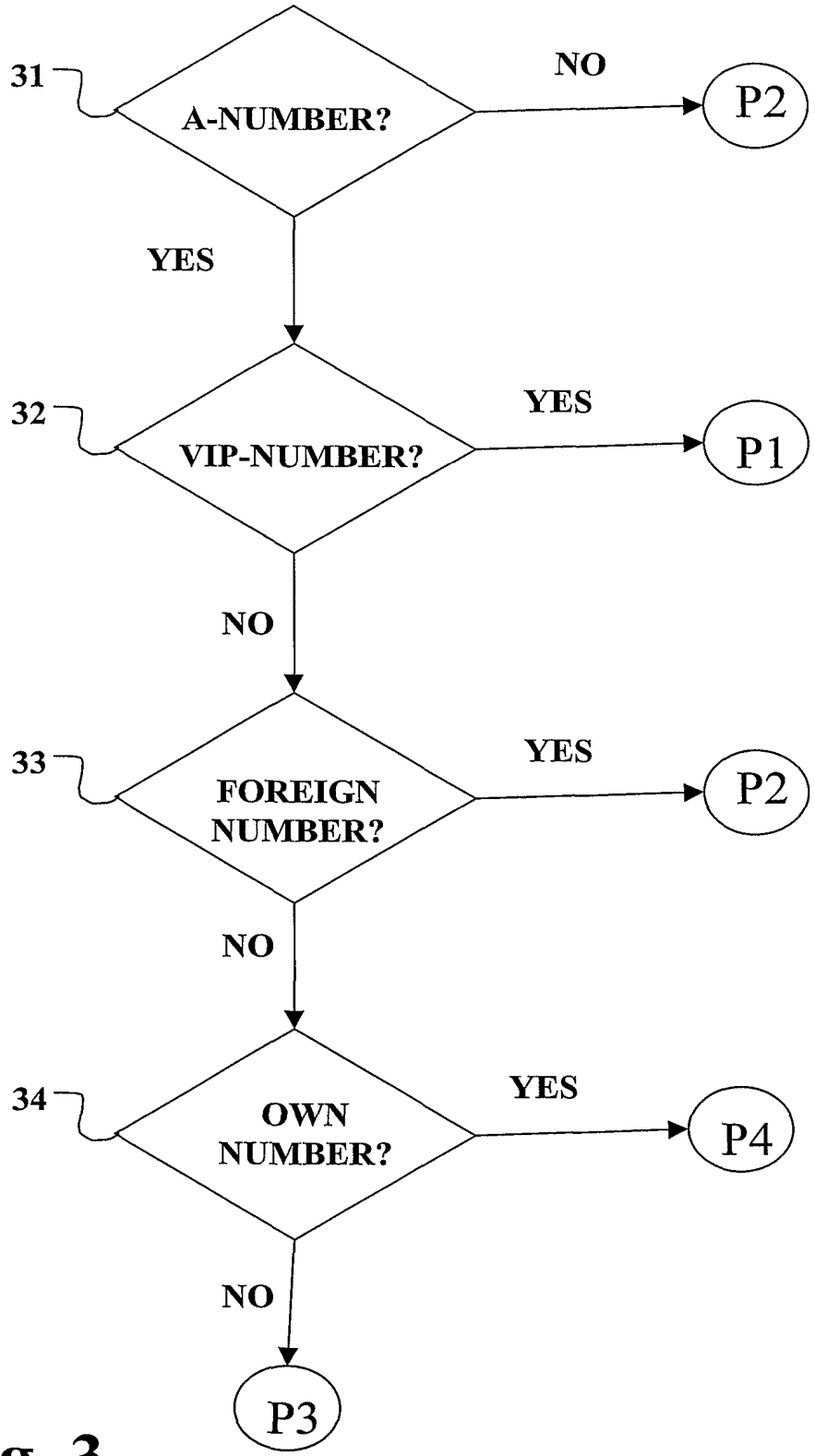

31
A-NUMBER?
NO
P2
YES
32
VIP-NUMBER?
YES
P1
NO
33
FOREIGN NUMBER?
YES
P2
NO
34
OWN NUMBER?
YES
P4
NO
P3

Fig. 3

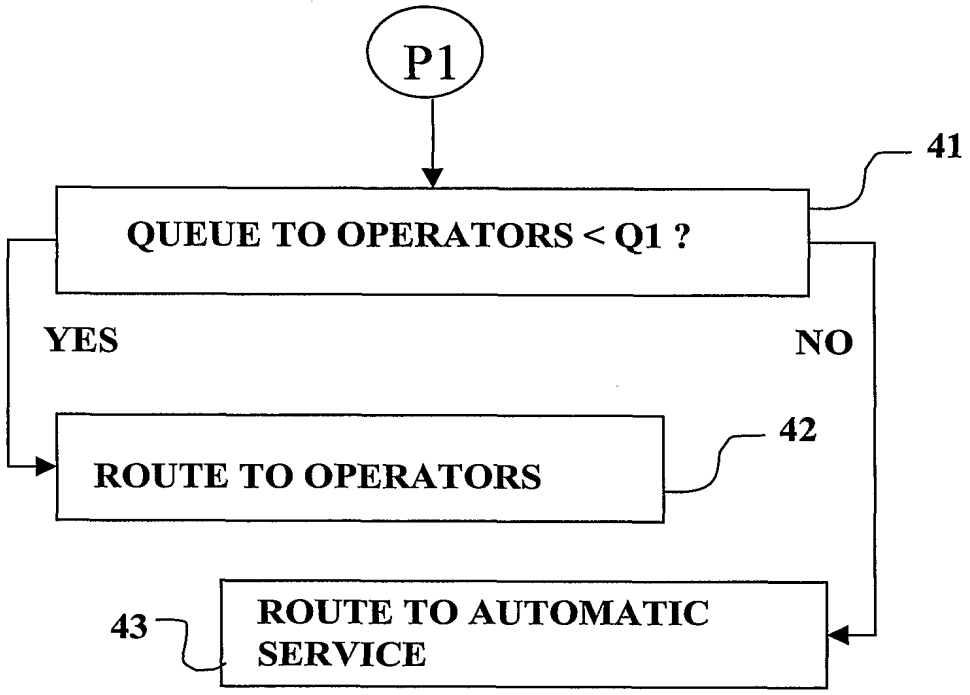

P1
41
QUEUE TO OPERATORS < Q1 ?
YES
NO
42
ROUTE TO OPERATORS
43
ROUTE TO AUTOMATIC SERVICE

Fig. 4

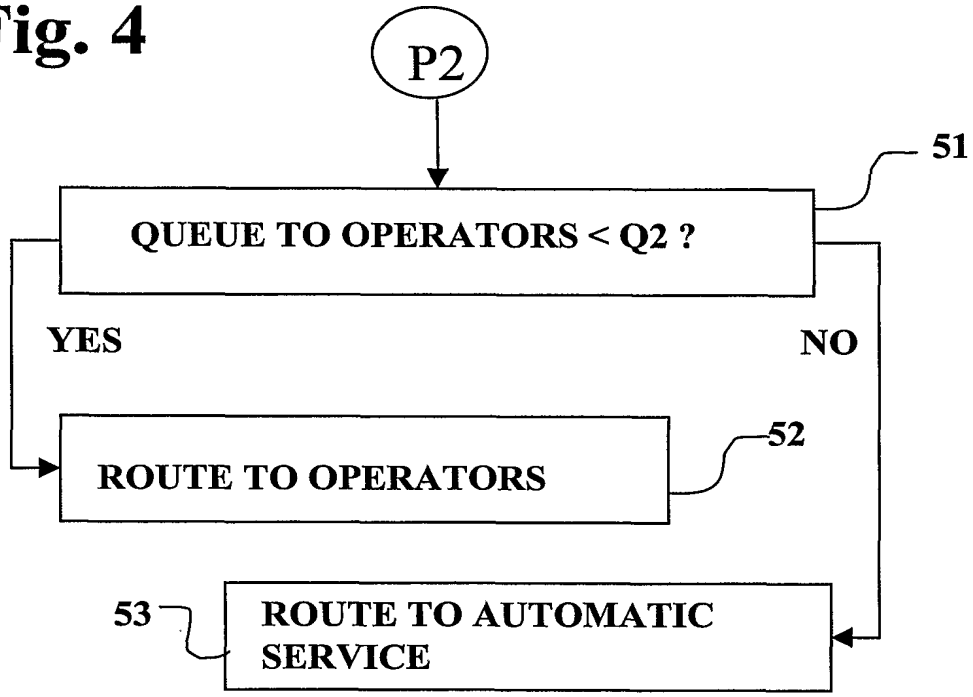

P2
51
QUEUE TO OPERATORS < Q2 ?
YES
NO
52
ROUTE TO OPERATORS
53
ROUTE TO AUTOMATIC SERVICE

Fig. 5

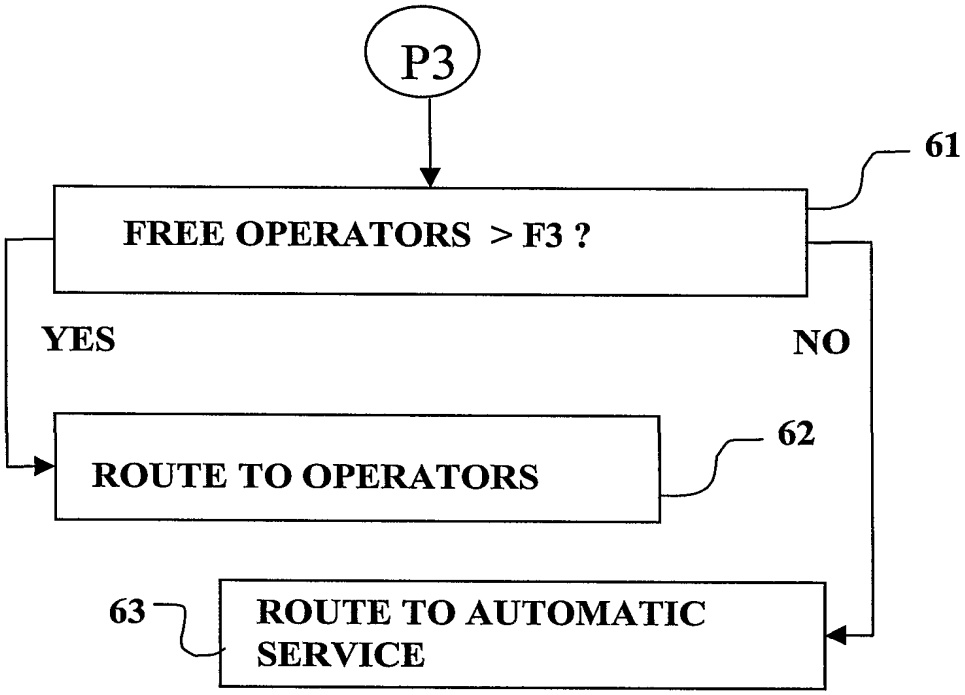

P3
61
FREE OPERATORS > F3 ?
YES
NO
62
ROUTE TO OPERATORS
63
ROUTE TO AUTOMATIC SERVICE

Fig. 6

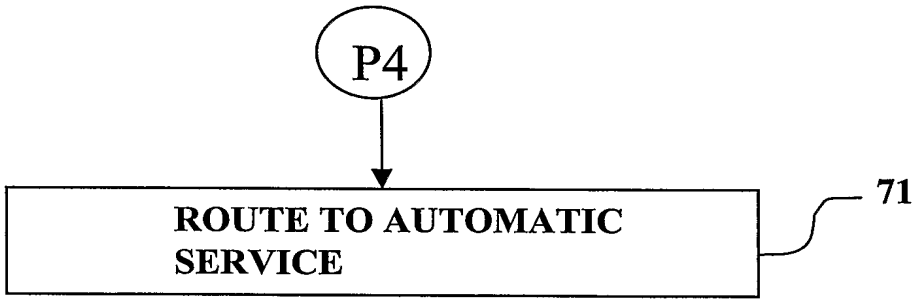

P4
71
ROUTE TO AUTOMATIC SERVICE

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 01/01011

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04M 3/51, H04M 1/64, H04M 3/42
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2270233 A (ROCKWELL INTERNATIONAL CORPORATION), 2 March 1994 (02.03.94), page 5, line 9 - line 17, claims 1,2,6, abstract --	1-22
Y	GB 2337892 A (MITEL CORPORATION), 1 December 1999 (01.12.99), page 2, line 26 - line 30; page 5, line 23 - line 29; page 6, line 21 - line 23, page 7 line 6 - 14, page 8 col 1, page 8 line 19 - 28, figure 1, claim 1, abstract --	1,5-6,11,21
Y	US 5396542 A (ALGER ET AL), 7 March 1995 (07.03.95), column 3, line 40 - line 44; column 8, line 25 - line 30; column 10, line 52 - line 54, claim 1, abstract --	2-4,7-10, 12-20

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 February 2002	04 -03- 2002
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Elisabet Åselius/JAn Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 01/01011

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5185781 A (DOWDEN ET AL), 9 February 1993 (09.02.93), figures 1,5, abstract -- --------	1-21

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/01/02

International application No.
PCT/FI 01/01011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2270233 A	02/03/94	CA 2103858 A	12/02/94
		GB 9316543 D	00/00/00
		JP 7030936 A	31/01/95
		US 5857018 A	05/01/99
GB 2337892 A	01/12/99	GB 9811293 D	00/00/00
US 5396542 A	07/03/95	NONE	
US 5185781 A	09/02/93	AT 165483 T	15/05/98
		CA 2050376 C	14/03/95
		DE 69129287 D,T	27/08/98
		EP 0480622 A,B	15/04/92
		SE 0480622 T3	
		HK 1004936 A	00/00/00
		JP 2948960 B	13/09/99
		JP 4265050 A	21/09/92
		MX 9101466 A	05/06/92
		CA 2050395 C	14/03/95
		US 5163083 A	10/11/92
		US 5181237 A	19/01/93